

## SUPERCONDUCTING CONSTANT CURRENT SOURCE

### ABSTRACT OF THE DISCLOSURE

An on-chip current regulator for a superconducting logic circuit isolates the superconducting logic circuit from external noise, reduces the effects of process fluctuations on the performance of the logic circuit and significantly reduces total circuit power requirements. The on-chip current regulator in accordance with the present invention includes one or more hysteretic Josephson junctions each connected in parallel with a resistor forming a resistively shunted junction (RSJ) or includes a self-shunting junction. One RSJ may be coupled between an off-chip current regulator and the hysteretic Josephson junction that functions as a current limiting resistor and provides improved isolation from external noise. One or more RSJs may be coupled between the hysteretic Josephson junction and the superconducting logic circuit which functions as a biasing resistor but at the same time reducing the sensitivity of the superconducting logic circuit to any process fluctuations in the biasing resistor which improves manufacturing yield. In an alternate embodiment of the invention, one or more RSJs can be used in place of the RSJ and the biasing resistor. In another alternate embodiment of the invention, the current regulator is formed from an RSJ and a serially coupled damping impedance.